Integrating tachymetric surveying and ERT measurements to construct the sliding plane of an active landslide near Maria Eck monastery (Bavarian Alps, Germany)

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Results from long-term tachymetric monitoring prove slow subsidence movement of buildings at Maria Eck monastery, located on top of the flysch-dominated Fürstberg ridge in SE Bavaria, Germany. Since 2009 horizontal slope movement has also been observed in dip direction of the slope and directly below a residential house of the monastery (Fig. 1). Horizontal translation rates could be quantified as much higher (11 cm/year) compared to those measured directly at the residential house (5 mm/year). This implies the idea of a currently forming landslide with a backscar that separates areas, where vertical subsidence movement is dominating, from areas that are majorly influenced by horizontal translation movement downslope.

To constrain the landslide geometry ERT-measurements were carried out along profiles in dip direction of the slope. The sliding plane was interpreted along the transition from a shallow zone, with a heterogeneous distribution of resistivity values (disintegrated landslide mass), to a deeper zone with rather homogenous resistivity values (sliding plane and bedrock) at 35 m depth. However, for an interpretation of a backscar the inversion results from ERT are considered as too diffuse. In order to constrain the possible location of the backscar, we are presenting a modelling approach that includes the 2D geometric construction of a listric sliding plane by translating the geometry of movement vectors from annually tachymetric monitoring parallel into depth. Given the depth to the sliding plane interpreted from ERT inversion as a starting point, the modelling approach produces a backscar that intersects the surface directly below the monastery's supply road. This result can be used as guidance for future stability analysis and for the design of remedial works.

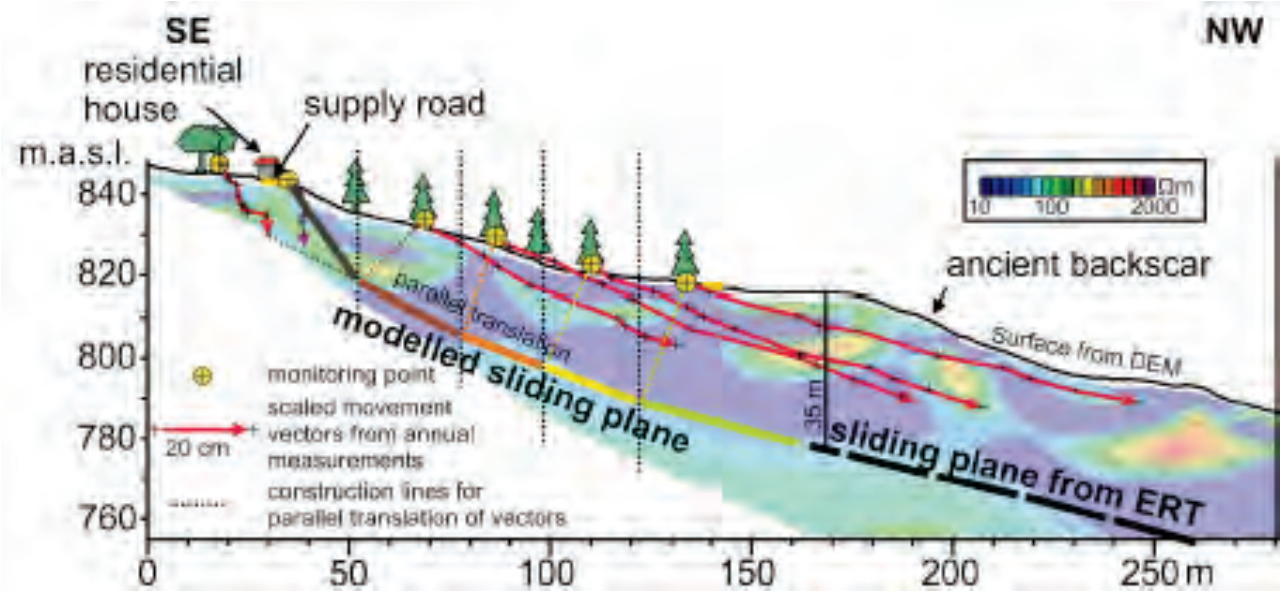

Figure: Cross-section of the northern Fürstberg ridge with ERT inversion results. For the sliding plane construction each movement vector is translated parallel into depth, starting with a sliding plane geometry interpreted from ERT inversion results.